within the specification limits too. In this manner, the tuning range of the ESD protection device is drastically increased. The tuning range for the voltages Vh, Vt, and BV is now almost as wide as the difference between the specification limits **510** and **511**. The undesirable variance between different types of devices is also unlike to cause failure due to the increased tuning range. In addition, if Vh is tuned to be greater than VDD, that will substantially eliminate the latch-up problems.

[0074] According to an aspect of the instant disclosure, an electrostatic discharge (ESD) device is provided. The ESD device comprises a first doped region formed within a substrate upon which the ESD device is formed. The ESD device comprises a second doped region within the substrate, such that current flows from the second doped region to the first doped region during an ESD event. The ESD device comprises a dielectric isolation structure formed between the first doped region and the second doped region. The dielectric isolation structure is formed at a depth that is less than at least one of a first depth of the first doped region or a second depth of the second doped region. During the ESD event, the current flows from the second doped region, substantially under the dielectric isolation structure, to the first doped region. Because the dielectric isolation structure is formed at a relatively shallower depth than the first doped region or the second doped region, the current flows along a relatively shorter path having a lower resistance, which enables the ESD device to carry a higher current during the ESD event before failure.

[0075] According to an aspect of the instant disclosure, an apparatus comprising an electrostatic (ESD) device is provided. The ESD device comprises a collector formed within a substrate upon which the ESD device is formed. The collector comprises a first doped region that is doped according to a first doping polarity. The ESD device comprises an emitter formed within the substrate. The emitter comprises a second doped region that is doped according to the first doping polarity. The ESD device comprises a dielectric isolation structure formed between the collector and the emitter. The dielectric isolation structure comprises a resist protective (RPO) layer that is configured to provide isolation between the collector and the emitter. In an embodiment, the RPO layer is formed to a depth that is less than at least one of a first depth of the first doped region of the collector or a second depth of the second doped region of the emitter. During an ESD event, current flows from the emitter, substantially under the RPO layer, to the collector. In an embodiment, because the RPO layer is formed at a relatively shallower depth than at least one of the emitter or the collector, the current flows along a relatively shorter path having a lower resistance, which enables the ESD device to carry a higher current during the ESD event before failure.

[0076] According to an aspect of the instant disclosure, an apparatus comprising an electrostatic (ESD) device is provided. The ESD device comprises a collector formed within a substrate upon which the ESD device is formed. The collector comprises a first doped region that is doped according to a first doping polarity. The ESD device comprises an emitter formed within the substrate. The emitter comprises a second doped region that is doped according to the first doping polarity. The ESD device comprises a dielectric isolation structure formed on top of a surface of the substrate. The dielectric isolation layer is configured to provide isolation between the collector and the emitter. During an ESD event, current flows from one of the terminals, substantially under the dielectric isolation layer, to another terminal. Because the dielectric isolation structure is formed at a relatively shallower depth than at least one of the emitter or the collector, the current flows along a relatively shorter path having a lower resistance, which enables the ESD device to carry a higher current during the ESD event before failure.

[0077] One of the broader forms of the present disclosure involves an apparatus. The apparatus includes a BJT device. The BJT device includes: a collector disposed in a substrate, the collector including: a first doped element and a second doped element disposed over the first doped element, wherein the first and second doped elements each have a first doping polarity, and wherein the second doped element has a greater doping concentration level than the first doped element; a base disposed in the substrate and adjacent to the collector, the base including: a third doped element having a second doping polarity different from the first doping polarity, wherein a p-n junction is formed between the third doped element and one of the first and second doped elements; and an emitter disposed over the base, the emitter including a fourth doped element having the first doping polarity, wherein the fourth doped element has a greater doping concentration level than the third doped element.

[0078] Another one of the broader forms of the present disclosure involves an ESD protection device. The ESD protection device includes: a substrate; a collector component of a bipolar junction transistor (BJT) device formed in the substrate, wherein the collector component is progressively doped in a manner such that a portion of the collector component closer to the surface of the substrate is more heavily doped than a portion of the collector component further away from the surface of the substrate; a base component of the BJT device formed in the substrate, the base component forming a first p-n junction with the collector component; and an emitter component of the BJT device formed on the base component, the emitter component forming a second p-n junction with the base component; wherein the base component is oppositely doped from the collector component and the emitter component.

[0079] Another one of the broader forms of the present disclosure involves an ESD protection device. The ESD protection device includes a BJT device. The BJT device includes: a bipolar junction transistor (BJT) device, the BJT device including: a first p-n interface formed by a collector of the BJT device and a base of the BJT device, the collector including a plurality of doped features all having the same doping polarity but different doping concentration levels, the base being laterally disposed with respect to the collector and including one or more doped features; and a second p-n interface formed by the base and an emitter of the BJT device, the emitter being vertically disposed with respect to the base and including a doped feature formed above the base, the emitter having a greater doping concentration level than the base therebelow; wherein: the doped features of the base are of an opposite doping polarity from the doped features of the collector and the emitter; and a turn-on voltage, a breakdown voltage, and a holding voltage of the BJT device are each correlated with a layout parameter of the BJT device.

[0080] The foregoing has outlined features of several embodiments so that those skilled in the art may better understand the detailed description that follows. Those skilled in the art should appreciate that they may readily use the present disclosure as a basis for designing or modifying other processes and structures for carrying out the same purposes